

A sewing machine

1. Field of the Invention

The invention relates to a sewing machine with a sewing needle drive and a forward feed drive for the garment, comprising a continuous rotational drive, a belt conveyor for the garment and an intermediate drive with two gearwheels disposed between the rotational drive and the belt conveyor, of which the gearwheel on the driven side can be twisted relative to the one on the drive side with overfeed or underfeed by means of a control lever driven by an eccentric drive depending on the sewing needle drive.

2. Description of the Prior Art

In order to obtain an intermittent forward feed of the garment by a continuous rotational drive it is known (WO 98/15678 A1) to drive a belt drive via the continuous rotational drive with two stationary held gearwheels about which the belt arranged with excess length is guided. Two guide rollers are used for tensioning the belt, which rollers are arranged on a control lever arranged coaxially relative to a gearwheel and constrict the endless pull of the belt between the gearwheels in a middle position of the control lever. When the control lever with the guide rollers is swiveled from its central position to one side, the strand of the belt situated on the swiveled side is released by the associated guide roller, whereas the guide roller for the other strand of the belt pulls the same into the intermediate space between the two gearwheels, leading to a mutual twisting of the gearwheels. The swiveling of the control lever to the opposite side leads to a rotation of the gearwheels in the opposite rotational direction, so that during the drive of the one gearwheel by the continuous rotational drive said reciprocating rotational movement overlaps the continuous rotational movement of the gearwheel on the driven side, which is thus

additionally subjected to overfeed or underfeed relative to the gearwheel on the drive side. By driving the control lever by an eccentric drive depending on the sewing needle drive it is thus possible to ensure an intermittent forward feed of the garment which is synchronous with the sewing needle drive in the case of a respective adjustment of the lever and transmission ratios. The disadvantageous aspect in this known forward feeding system for garments is however that as a result of the transversal displacement of the belt strands between the two gearwheels a comparatively complex construction is required leading to an additional load on the belt.

### Summary of the Invention

The invention is thus based on the object of providing a sewing machine of the kind mentioned above in such a way that a comparatively simple and operationally reliable construction is obtained.

This object is achieved by the invention in such a way that the two gearwheels are arranged as mutually combing gearwheels, of which the one on the driven side is held in a fixed link rotationally held about the axis of the gearwheel on the drive side, on which the control lever acts.

Since as a result of these measures the one on the driven side of the two mutually combing gearwheels is rotated back and forth via a fixed link about the axis of the gearwheel on the drive side, the rotation caused by the rotation of the fixed link overlaps the gearwheel on the driven side with the effect that the gearwheel on the driven side is driven periodically with overfeed and underfeed, which in the case of a respective configuration of the lever and transmission ratios leads to the demanded intermittent forward feed of the garment, without having to take into account the disadvantages linked to the use of a belt drive with an excessively long belt. It is merely necessary to ensure a respective throw of the fixed link connecting the two toothed wheels. This can easily be achieved by means of the control lever acting upon the fixed link.

Since the gearwheel on the driven side of the intermediate drive is swiveled about the axis of the gearwheel on the drive side, it is necessary to take this swiveling movement into account in the drive connection between the gearwheel on the driven side and the belt conveyor for the forward feed of the garment. For this purpose, the gearwheel on the driven side of the intermediate drive could drive a gear stage with an uneven number of gearwheels, of which the one on the driven side is held coaxially relative to the gearwheel on the drive side of the intermediate drive. The rotational movement for the belt conveyor can be taken from said stationary gearwheel on the driven side of the gear stage. Simpler constructional conditions are obtained however when the drive connection between the gearwheel on the driven side of the intermediate drive and the belt conveyor comprises a belt drive whose deflection pulleys are held coaxially to the two gearwheels of the intermediate drive.

When the control lever is arranged as connecting rod of the eccentric drive whose eccentric shaft extends parallel to the drive shaft of the sewing needle drive and is connected with the same by means of a belt drive, compact constructional conditions can also be created in the area of the control lever drive. Moreover, by arranging an eccentric drive which is separate from the drive shaft of the sewing needle drive, an arrangement of the control lever drive is facilitated which is adjusted to the respective constructional conditions.

#### Brief Description of the Drawings

The subject matter of the invention is shown by way of examples in the drawings, wherein:

- Fig. 1 shows a sewing machine in accordance with the invention with a sewing needle drive and a forward feed drive for the garment in a schematic side view;
- Fig. 2 shows the sewing needle drive and the forward feed drive according to Fig. 1 in a front view on an enlarged scale, and

Figs. 3 to 5 show the sewing needle drive and the forward feed drive in an illustration corresponding to Fig. 2, but with different working positions.

### Description of the Preferred Embodiments

The sewing machine 1, which is only indicated with the dot-dash line, comprises a needle bar 2 for receiving sewing needles 3 and a sewing needle drive 4 which consists of a drive shaft 5 and a crank mechanism 6 which acts upon the needle bar 2. A belt conveyor 7 is provided for the forward feed of the garment, which conveyor is composed of two parallel conveyor belts 8 between which the needles 3 penetrate the garment. The drive for the belt conveyor 7 is derived from a continuous rotational drive 9 which is preferably driven electrically and is arranged on a base plate. An intermediate drive 10 is driven by said rotational drive, which intermediate drive comprises two mutually combing gearwheels 11 and 12. While the gearwheel 11 on the driven side of the intermediate drive 10 is fixedly situated on the driven shaft of rotational drive 9, the gearwheel 12 on the driven side is rotatably held in a fixed link 13 which is held in a freely rotatable manner on the driven shaft of the rotational drive 9. A control lever 14 is linked to the fixed link 13, which lever forms the connecting rod of an eccentric drive 15 whose eccentric shaft 16 is in drive connection by way of a belt drive 17 with the parallel drive shaft 5 of the sewing needle drive 4.

The drive connection to the belt conveyor 7 for the garment is derived from the intermediate drive 10 via a belt drive 18 which is used for compensating the oscillating movement of the fixed link 13. For this purpose, the shaft 19 on the driven side of the belt drive 18 is held coaxially to the driven shaft of the rotational drive 9, so that the swiveling movement of the shaft 20 of said belt drive 18 is compensated, which shaft is on the drive side and is connected to gearwheel 12, and the continuing drive train can start from the stationarily held shaft 19. Said drive train is formed in accordance with the illustrated embodiment by a further belt 21, by means of whose driven shaft 22 the conveyor belts 8 of the belt conveyor 7 are driven.

As is shown in Figs. 3 and 5, the fixed link 13 assumes a middle swiveling position in the upper and lower dead center position of the crank mechanism 6 of the drive 4 for the garment, from which it is deflected according to Figs. 2 and 4 depending on the respective direction of movement of the needle bar 2 to the one or other side. Since the two gearwheels 11 and 12 which are connected with each other via the fixed link 13 comb one another, a swiveling of the fixed link 13 leads to a mutual twisting of said gearwheels 11 and 12. As a result of the continuous drive of the gearwheel 11 on the drive side, this means that the gearwheel 12 on the driven side is driven with overfeed or underfeed depending on the direction of deflection of the fixed link 13 relative to the gearwheel 11 on the drive side. The gearwheel 12 on the driven side is thus twisted in a swiveling movement of the fixed link 13 against the direction of rotation of the gearwheel 11 on the drive side according to Fig. 5 with a larger speed than gearwheel 11 and in the case of a swiveling displacement of the fixed link 13 in the direction of rotation of gearwheel 11 according to Fig. 3 with a smaller speed than gearwheel 11. In the case of a respective configuration of the lever and transmission ratios, it is thus possible during the swiveling of the fixed link 13 from the deflection position according to Fig. 2 via the lower dead center position of the crank mechanism 4 according to Fig. 3 to the deflection position according to Fig. 4, i.e. during the penetration of the needles 3 into the garment, to achieve a standstill of the drive of the conveyor belt 7 derived from the intermediate drive 10 for the garment, whereas during the opposite swiveling movement of the fixed link 13 from Fig. 4 via the upper dead center of the crank mechanism 4 according to Fig. 5 to the opposite deflection position according to Fig. 2 a respective forward feed for the garment is ensured.